

Regional Signal Timing Program

Project Administration

Deliverables

1. Detailed Workscope, Schedule, and Budget (DWSB)
 - Prepared by the consultant.
 - Should include project understanding; detailed task descriptions, including meetings and assumptions on data to be obtained from city; milestone deadlines; level of effort; and budget.
 - Changes to scope of work after final DWSB must be approved by MTC.
2. Existing Conditions Technical Memorandum, including computer model with existing timings
 - Will summarize the data collected to date and will be used as the baseline for improvements. Sponsor and other stakeholders to decide whether data makes sense and model is sufficiently calibrated.
 - Will also contain preliminary recommendations for optimization of actuated settings.
3. Recommendations Technical Memorandum, including computer model with recommended timings
 - Will contain approved changes to actuated settings, and recommended time-of-day coordination plans and hours of coordinated operation.
 - Discussion will include analyses of signal groupings, phasing, cycle lengths, splits, and offsets, as well as expected improvements.
 - Sponsor and other stakeholders to decide if recommendations are consistent with their objectives for the project.
4. A. Draft Timing Sheets
 - Will contain timings to be used for implementation. Sponsor and other stakeholders to review for consistency with approved timings.B. Final Timings and Evaluation Technical Memorandum, including final timing sheets and computer model with final timings
 - Will contain final timings that were implemented and fine-tuned, as well as measured improvements.

Deliverable Review

- All deliverables subject to review and approval by sponsor, other stakeholders, and MTC.
- MTC's review to focus on adherence to approved scope of work.
- Consultant will indicate when comments are due and follow-up with sponsor as deadline nears.
- Requests for extension of review period should go through MTC. No communication with either MTC or the consultant by the time a deadline has passed may be grounds for terminating the project.
- Please cc MTC on all written correspondence, including e-mail.
- MTC will provide copies of our comments to the sponsor.

Schedule

Timing plans should be implemented in September-October, and the after study and evaluation memo should be completed in November-December, unless otherwise indicated in DWSB and approved by MTC.

Grant Administration

- Consultant will submit invoices to MTC directly.
- Payment will correspond to approval of deliverables. Roughly corresponds to level of effort.

Conflict Resolution

Notify MTC as soon as possible.

Standardized Scope of Work for All RSTP Consultants

The services to be performed by CONSULTANT shall consist of services requested by the Project Manager or a designated representative including, but not limited to, the following:

1. Project Start-up

- 1.1. **Project Kick-Off Meeting** – CONSULTANT will schedule a meeting with the project sponsor, other involved agencies, and MTC Project Manager or designated representative to kick-off the project; establish communication channels and protocols; discuss the scope of work, schedule, and budget; gather available information; and obtain a thorough understanding of the goals for the project. Specific topics to discuss include the two-hour period for turning movement data collection and times to collect travel time data.
- 1.2. **Preparation of Detailed Workscope, Schedule, and Budget** – CONSULTANT will prepare a detailed workscope, schedule, and budget (DWSB) for review and approval by the project sponsor, other involved agencies, and MTC Project Manager. CONSULTANT will finalize the DWSB based on comments received from the project sponsor, other involved agencies, and MTC Project Manager.

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| Deliverable 1: | Final Detailed Workscope, Schedule, and Budget |
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2. Analysis of Existing Conditions

CONSULTANT will collect and analyze all information necessary to thoroughly understand existing traffic conditions in the study area and be able to develop optimal time-of-day traffic signal coordination plans and transit signal priority plans, if applicable.

- 2.1. **Data Collection** – CONSULTANT will collect existing conditions data including, but not limited to, the following:
 - 2.1.1. From the project sponsor and other involved agencies, CONSULTANT will collect existing timing sheets, existing coordination plans, traffic signal as-built drawings, aerial photos, maps, and collision diagrams for the study intersections, if available.
 - 2.1.2. From the project sponsor and other involved agencies, including transit properties, if any, CONSULTANT will collect signal timing and signal priority preferences, including, but not limited to, those related to pedestrian and bicycle timing, leading and lagging left-turn phasing, and conditional service, as well as the timing optimization software preference.
 - 2.1.3. CONSULTANT will conduct weekday two-hour peak period turning movement counts at all study intersections, including pedestrian and bicycle counts, and seven-day 24-hour machine counts at strategic locations to determine periods of coordination. All counts shall be taken during times and days that are representative of the times and days for which coordination plans will be developed. It is preferred that all counts be summarized in MS Excel format. Electronic files shall be named in accordance with a naming convention to be specified by MTC.
 - 2.1.4. CONSULTANT will conduct a field review of all study intersections and street segments to verify lane geometry, speed limits, storage lengths, signal phasing, distances between intersections, and crosswalk lengths, unless the information is available through other sources such as aerial photos and speed surveys. CONSULTANT will conduct a field review at key intersections to measure queue lengths and saturation flows for heavy movements.

- 2.1.5. CONSULTANT will conduct a field review to observe typical traffic patterns during the weekday peak periods for which coordination plans will be developed. CONSULTANT will note factors that are expected to affect signal progression including, but not limited to: intersections with high pedestrian or bicyclist volumes; over-saturated intersections; uneven lane distribution; high volumes of trucks and buses; high-volume unsignalized intersections, including interchanges; parking maneuvers; presence and location of bus stops, etc.
- 2.1.6. CONSULTANT will verify signal coordination and transit priority capabilities of existing equipment and communications infrastructure. CONSULTANT will take digital photos of the controller cabinet and the contents of the controller cabinet. The digital photos may be taken during timing plan implementation, at the discretion of CONSULTANT.
- 2.1.7. CONSULTANT will conduct travel time and delay studies, including number of stops, at key corridors during times and days that are representative of the times and days for which coordination plans will be developed. A minimum of four runs shall be conducted for each direction for each peak period. Travel time and delay studies shall be conducted using the floating car method. The time of performance of the travel time and delay studies will be defined at the kick-off meeting.

2.2 Analysis of Existing Conditions – CONSULTANT will analyze the data obtained from Task 2.1 as follows:

- 2.2.1 As permitted by the project stakeholders, CONSULTANT will review initial and actuated settings for each study intersection to identify opportunities to minimize delay during non-coordination periods and enhance pedestrian and bicyclist safety. The analysis shall include, but not be limited to, review of minimum and maximum green settings; yellow and red times; pedestrian timing; and gap, extension, and reduction settings.
- 2.2.2 CONSULTANT will review collision diagrams for the study intersections, if available, to identify patterns that are susceptible to correction through signal timing.
- 2.2.3 Using software specified by the project sponsor, CONSULTANT will develop a model of the study area and calibrate the model based on field observations of existing conditions. Signal coordination optimization software may include, but not be limited to, Synchro, TRANSYT 7-F, or PASSER. Transit signal priority modeling software may include, but not be limited to, VISSIM or Paramics. CONSULTANT will calibrate the model based on travel time and delay studies and field observations of queue lengths and saturation flows for heavy movements at key intersections.
- 2.2.4 CONSULTANT will summarize the results of the existing conditions analyses in an Existing Conditions Technical Memorandum. At a minimum, the Memo will include: description of the roadway network and surrounding land uses, including a map showing the study intersections; description of traffic volumes, including day-to-day variability and directionality; description of traffic signal controllers and communication capabilities; identification of factors that are expected to affect progression; results of analysis of initial and actuated settings; description of collision patterns that may be susceptible to correction through signal timing; measures of effectiveness, including delay, number of stops, and travel time from the travel time and delay studies, and fuel consumption and emissions using a methodology specified by MTC; and model calibration results, including a summary of changes to the optimization software's default values. CONSULTANT may be required to meet with the project sponsor and other involved agencies to present and discuss the results of the Memo. CONSULTANT will finalize the Memo based on comments received from the project sponsor, other involved agencies, and MTC Project Manager.

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| Deliverable 2: | Draft and Final Existing Conditions Technical Memorandum, including computer model with existing timings |
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3. Development of Draft Recommendations

CONSULTANT will develop recommendations of optimal initial and actuated settings; time-of-day coordination plans and hours of coordinated operation; and transit signal priority plans and hours of operation, if applicable. Development of optimal time-of-day coordination plans shall include analyses of signal grouping; phasing and phase sequence, including conditional service; cycle lengths, splits, and offsets. CONSULTANT will summarize recommendations in a Recommendations Technical Memorandum. The Memo shall also include a comparison of existing and proposed timings and a description of expected improvements. CONSULTANT will finalize the Memo based on comments received from the project sponsor, other involved agencies, and MTC Project Manager.

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| Deliverable 3: | Draft and Final Recommendations Technical Memorandum, including computer model with recommended timings |
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4. Implementation and Evaluation

CONSULTANT will implement and evaluate the approved improvements as follows:

- 4.1 CONSULTANT will prepare for review and approval by the project sponsor and other involved agencies appropriate timing sheets based on the approved timing plans. CONSULTANT will revise the timing sheets based on comments received from the project sponsor and other involved agencies.
- 4.2 CONSULTANT will implement, or assist agency staff in the implementation of, the new settings and timings. Implementation may have to be done in the field or from a central location, depending upon communication capabilities and agency preferences.
- 4.3 CONSULTANT will fine-tune, or assist agency staff in the fine-tuning of, the new settings and timings. CONSULTANT will fine-tune timings in the field and record all changes. Fine-tuning shall be conducted during times and days that are representative of the times and days for which coordination plans were developed.
- 4.4 CONSULTANT will conduct travel time and delay studies, including number of stops, at the key corridors identified under Task 2.1.7. Travel time and delay studies shall be conducted during times and days that are representative of the times and days for which coordination plans were developed. A minimum of four runs shall be conducted for each direction for each peak period. Travel time and delay studies shall be conducted using the floating car method.
- 4.5 CONSULTANT will calculate measures of effectiveness of the improved system, including delay, number of stops, travel time, fuel consumption, emissions, benefit:cost, and cost effectiveness for emissions reductions. The methodology for calculating fuel consumption, emissions, benefit:cost, and cost effectiveness for emissions reductions will be specified by MTC.
- 4.6 CONSULTANT will prepare a Final Timings and Evaluation Technical Memorandum, which will include but not be limited to: the final periods of coordination; changes between the timings recommended under Task 3 and the final timings that were implemented; the number of locations where changes were made to better accommodate pedestrians and/or bicyclists; and the results of the evaluation of measures of effectiveness.

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| Deliverable 4A: | Revised Timing Sheets |
| Deliverable 4B: | Final Timings and Evaluation Technical Memorandum, including Final Timing Sheets and computer model with final timings |

5. Additional Services

For complex projects, such as those involving transit signal priority, cut-through traffic, multiple traffic signal systems, cross-coordination, etc., CONSULTANT may be requested to perform services in addition to those described above. Such services may include, but are not limited to, additional meetings, field visits, studies, fine-tuning, etc. Should additional services be requested, CONSULTANT shall include a detailed description of such additional services, a staffing plan, and a man-hour estimate in its DWSB. The scope of these services, as well as the fixed price to be added to the base fee per intersection set forth in Article 3B, will be negotiated on a case-by-case basis. Additional services may also be requested by CONSULTANT after the DWSB has been approved by requesting an amendment to the approved DWSB.

6. Reduced Services

CONSULTANT may be requested to perform only some of the services described under Tasks 1 through 4 above in cases where agency staff wishes to perform some of the services themselves. Should reduced services be requested, CONSULTANT shall identify in its DWSB which tasks will be performed by the CONSULTANT and which will be performed by the agency. The fee for reduced services shall be a percentage of the base fee per intersection set forth in Article 3B that is commensurate with the proportion of the services to be performed by CONSULTANT. Deliverables will be negotiated on a case-by-case basis.

Project Schedule

| <u>Task</u> | <u>Deadlines for 2008 and 2009 Cycles</u> |
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| 1. Project Start-Up | |
| Kick-Off Meetings | January & February |
| Detailed Workscope, Schedule, and Budget (DWSB) | Final DWSB by Early March |
| 2. Analysis of Existing Conditions | |
| Data Collection | February through April |
| Analysis | May |
| 3. Draft Recommendations | June & July |
| 4. Implementation and Evaluation | Implementation in September & October; Final Report in November & December |